



Transport Canada  
Safety and Security

Transports Canada  
Sécurité et sûreté

Tower C, Place de Ville  
11<sup>th</sup> Floor  
330 Sparks Street  
Ottawa, Ontario  
K1A 0N8

Tour C, Place de Ville  
11<sup>e</sup> étage  
330, rue Sparks  
Ottawa (Ontario)  
K1A 0N8

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To: Owners of Small Non-pleasure Vessels

**SUBJECT:    SHIP SAFETY BULLETIN 07/2006**  
**Guidance for Assessing Intact Stability and Buoyancy**  
**of Existing Small Non-pleasure Vessels**

The enclosed Ship Safety Bulletin has been sent to you as our records indicate that you own a small commercial (non-pleasure) vessel of not more than 15 gross tonnage, or have an interest in the subject.

The Ship Safety Bulletin explains that owners and masters are responsible for ensuring that vessels are seaworthy, including understanding a vessel's stability limits. Since April 2005, the *Small Vessel Regulations* require that there's an assessment of the stability or flotation of small non-pleasure vessels built or put into service from that date. If your vessel was in service before April 2005, the *Simplified Assessment of Intact Stability & Buoyancy of Small Non-Pleasure Vessels: Assessment Guide\** outlines a simple process that can be used to determine whether a vessel has adequate stability.

Transport Canada encourages you to take the time to read the bulletin, and, if your vessel meets the application criteria, carry out the simplified assessment at your discretion.

Yours sincerely,

Victor Santos-Pedro  
Director,  
Design, Equipment and Boating Safety  
Marine Safety

Enclosure    Ship Safety Bulletin 07/2006

\*The *Assessment Guide* is available on-line at: <http://www.tc.gc.ca/MarineSafety/tp/tp14619/menu.htm>. A hard copy can be ordered from the Transport Canada publications website (<http://shop.tc.gc.ca/>). Enter 14619 in Quick Search and click Go to find the Guide. Note: If you have not ordered anything before, you will need to register before placing your order.

*Please note: This document has been provided in both official languages, as our records do not indicate your language of preference.*

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# SHIP SAFETY BULLETIN

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*Ship Safety Bulletins provide safety-related information to the marine community.  
 All bulletins are available at: [www.tc.gc.ca/marinesafety](http://www.tc.gc.ca/marinesafety)*

**Subject: Guidance for Assessing Intact Stability and Buoyancy of Existing Small Non-pleasure Vessels.**

**This Bulletin replaces Appendix A - Guidelines for Stability of Bulletin 02/2003 – 2003 Interim Small Vessel Compliance Program.**

This bulletin explains the options available to the owner of an existing small non-pleasure vessel for assessing the stability of that vessel.

## Introduction

The ability of a vessel to remain floating and upright in all conditions of loading and operation, in all reasonably expectable wave and weather conditions, is fundamental to a safe voyage.

Intact stability, buoyancy and watertight integrity requirements for new vessels (those whose construction started on or after April 1, 2005) came into effect on February 1, 2005. The *Small Vessel Regulations* now incorporate the *Construction Standards for Small Vessels*, TP 1332, and, as a result, new vessels are required to comply with the stability Standards of the International Organization for Standardization (ISO).

For existing vessels more than 6 metres long and not more than 15 gross tons that do not need annual inspections, there are no specific stability requirements other than the Canada Shipping Act requirement that owners and masters use all reasonable means to ensure vessels are seaworthy (S 391). This bulletin outlines acceptable stability criteria in order to provide a consistent basis for assessing whether existing vessels have adequate stability.

**Keywords:**

1. Stability
2. Small Vessels
3. SVMIP
4. Downflooding
5. Simplified Requirements

**Questions concerning this Bulletin should be addressed to:**

AMSRA	Transport Canada
Nico Pau	Marine Safety
(613) 998-4198	Tower C, Place de Ville
	11 <sup>th</sup> Floor, 330 Sparks Street
	Ottawa, Ontario K1A 0N8

To add or change your address, contact us at: [marinesafety@tc.gc.ca](mailto:marinesafety@tc.gc.ca)  
 Owners of commercial vessels, registered and licensed, automatically receive Bulletins.



## Application Criteria

This bulletin applies to existing non-pleasure vessels:

- greater than 6 metres in length overall;
- not more than 15 tons gross tonnage, or if not measured for tonnage, not more than 12 metres in length overall;
- carrying not more than 12 passengers and no more than 1,000 kilograms of cargo;
- not required to be inspected annually;
- engaged solely in domestic voyages;
- other than a commercial fishing vessel, a sailing, inflatable or multi-hulled vessel, a vessel engaged in towing, dredging or lifting operations, or any other vessel of non-conventional design or usage;
- not operated more than 25 nautical miles from shore; and
- whose construction started prior to April 1, 2005.

Vessels more than 15 gross tons or carrying more than 12 passengers must meet the criteria in [\*STAB 5 of Stability, Subdivision and Load Lines – TP 7301\*](#).

Vessels 6 metres or less in length built on or after April 1, 2005 must remain afloat if swamped ([\*Construction Standards for Small Vessels –TP 1332, Sections 4.2.7 & 4.2.8.\*](#)) A capacity label indicating maximum load/number of occupants indicates that a vessel meets this requirement.

## Purpose

The bulletin explains the options available to the owner for verifying the stability of an existing non-pleasure vessel to a recognized standard.

## Background

The ability to remain upright is fundamental to a vessel's level of safety. Incidents involving loss of stability are those most likely to lead to fatalities. Transport Canada is providing this guidance in order that owners can evaluate the stability of their vessels.

***Caution:** Compliance with any of the standards set out in this bulletin does not guarantee a vessel will not capsize or sink and does not take away the primary responsibility for the day-to-day safety of a vessel, passengers and crew which lies with the Master. Only the Master of a vessel can determine when it is safe to sail and how to respond safely to various operating conditions.*

## Assessment of Stability

The annex that follows outlines options available for assessing the stability of an existing non-pleasure vessel.

## More Information

If required, please contact the nearest Transport Canada Centre or a marine consultant for more information.

## **ANNEX I: Guidance for Stability Assessment of Existing Small Non-Pleasure Vessels**

### **Part 1: CHOICE OF STANDARD**

A prudent operator will want to be sure that a vessel has sufficient stability for the intended operation. This can be done by demonstrating the vessel meets the criteria of one of the international or Canadian standards listed in this part.

Instructions for carrying out assessments are given in the applicable standard or, for the simplified assessment described in Part 2 of this Annex, in the Transport Canada *Guide to the Simplified Assessment of Intact Stability and Buoyancy of Small Non-pleasure Vessels (the Guide)*. The *Guide* can be viewed, downloaded or ordered from the Transport Canada website <http://shop.tc.gc.ca/>.

If a vessel has been satisfactorily assessed to one of these standards and has not been modified since the assessment was carried out, no additional assessment need be done.

If no such assessment has been carried out, or if the vessel has been modified since the assessment was carried out, Transport Canada recommends that an assessment be carried out.

The vessel owner may choose the standard against which the vessel will be assessed.

### **INTERNATIONAL STANDARDS**

A number of marine administrations maintain standards for the minimum stability of small vessels. Three such standards follow.

- International Standards Organization (ISO) standards:
  - 12217-1 *Small craft - Stability and buoyancy - assessment and categorization*
  - 12216 *Small craft - Windows, port lights, hatches, deadlights and doors - strength and tightness requirements*
  - 11812 *Small craft - Watertight cockpits and quick draining cockpits*
- United States 46 *Code of Federal Regulations (Sub-Chapter T) Part 178*, sections 310 - Applicability based on length and passenger capacity; 320 - Intact stability requirements; 330 – Simplified Proof of Stability, in conjunction with all sections of Subpart D - Drainage of Weather Decks (178.410 - 178.450 inclusive), Subpart E - Special Installations (178.510) and section 175.400 (Definition of terms used in this subchapter)

- United Kingdom *Small Commercial Vessel and Pilot Boat Code of Practice* (temporarily listed as *Small Vessels in Commercial Use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards, Marine Guidance Note No. 280*)

These standards may be obtained from:

ISO International Organization for Standardization – <http://global.ihs.com>

US US Government Printing Office (hard copy) or via Internet at:

Part 178, Sections 310, 320, 330, 410-450 and 510

[http://www.access.gpo.gov/nara/cfr/waisidx\\_98/46cfr178\\_98.html](http://www.access.gpo.gov/nara/cfr/waisidx_98/46cfr178_98.html)

Part 175, Section 400

[http://www.access.gpo.gov/nara/cfr/waisidx\\_98/46cfr175\\_98.html](http://www.access.gpo.gov/nara/cfr/waisidx_98/46cfr175_98.html)

UK Maritime and Coastguard Agency - *The Small Commercial Vessel and Pilot Boat Code of Practice*

[http://mcga.gov.uk/c4mca/mgn\\_280.pdf](http://mcga.gov.uk/c4mca/mgn_280.pdf)

### **CANADIAN STANDARD**

Owners may also choose to have their vessel assessed to [\*STAB 6 of the Stability, Subdivision and Load Line Standards \(TP 7301\)\*](#), or, if the vessel falls within the application criteria, the [\*Transport Canada Simplified Assessment of Intact Stability and Buoyancy of Small Non-pleasure Vessels\*](#), described in Part 2 of this Annex.

### **OPTIONS FOR VESSELS THAT DO NOT MEET THE STANDARD**

Where a vessel does not fully comply with the requirements of the selected standard, the owner may choose to alter the vessel so that it does meet the standard, assess against another standard - the ISO standard is recommended as it has several categories of compliance - or, consider the options presented in the Guidelines for vessels that do not meet the standard in [\*Part 5\*](#) of this Annex.

**Contact your local Transport Canada Centre or a marine consultant if you need more information regarding an assessment of the stability of your vessel.**

## Part 2

### SIMPLIFIED ASSESSMENT OF INTACT STABILITY AND BUOYANCY OF SMALL NON-PLEASURE VESSELS

#### Purpose

Ensuring that a vessel has adequate stability, buoyancy and watertight integrity to protect passengers and crew.

The Simplified Assessment provides an indication that a vessel has adequate stability using a limited number of measurements and a very simple series of steps.

#### Application

These instructions and the *Guide* are provided to help an owner understand the criteria applied, and the process followed, in assessing an existing small non-pleasure vessel:

- more than 6 metres in length overall;
- not more than 15 tons gross tonnage, or if not measured for tonnage, not more than 12 metres in length overall;
- carrying not more than 12 passengers;
- carrying no more than 1,000 kilograms of cargo;
- engaged in domestic voyages;
- other than a commercial fishing vessel, a sailing, inflatable or multi-hull vessel, a vessel engaged in towing, dredging or lifting operations, or any other vessel of non-conventional design or usage;
- not operating more than 25 nautical miles from shore; and
- whose construction started prior to April 1, 2005

**Note:** The *Simplified Assessment* is not to be used on vessels whose construction started on or after April 1, 2005 (the ISO standards or STAB 5 of Transport Canada's *Stability, Subdivision and Load Line* Standards (TP 7301) must be used);

- operating in wave heights\* of not more than 2 metres (6.5 feet) if *fully decked* (as defined on page 7) and
- operating in wave heights\* of not more than 1.2 metres (4 feet) if an *open* vessel (as defined on page 7).

\* Wave height – vertical distance from crest to trough of wave

## Assessment Overview

The following tests and measurements are required to assess the vessel:

- Downflooding height\* in upright condition
- Heel angle during offset load heel test
- Residual downflooding height (downflooding height\* in heeled condition)

Record the results of the above tests in the *Guide* and verify that the measurements fall within the acceptable criteria contained in Part 4 of this Annex.

\*Downflooding height – the lowest height measured from the waterline to an opening, e.g. vents, non-watertight hatches, gunwale, that will allow water to enter the interior of the boat or bilge of the vessel.

Refer to Part 3 of this Annex for examples of downflooding height measurements.

## Preparation

Before starting the assessment, check that the required equipment is at hand and that the test conditions are met.

## Equipment

- Measuring tape;
- (Optional equipment for measuring the angle of heel): pendulum (string and weight) and marker, or clinometer;
- Weights representing full complement of passengers and crew (75 kg per person) and, if applicable, cargo and/or diving equipment (36 kg per diver). Weights may consist of: water-filled drums; jerry cans; fish boxes; sandbags, etc. As a last resort, people may be used if life jackets are worn and testing is carried out with caution;
- Garden hose, with jet nozzle, capable of a continuous flow of a least 10 litres per minute; and
- Scale to verify weights if not determinable by other means.

## Test conditions

- Calm water, mooring lines slack;
- Vessel in fully loaded condition at design trim;
- Scuppers and downflooding openings that may be immersed during offset load test may be temporarily sealed as a precautionary measure to prevent water from entering the vessel during the test;
- Tanks carrying liquids are not less than 75% full;

- Weights located to reflect typical operational distribution of complement;
- Vertical centre of gravity (CG) for simulated passenger weights as close as possible to 0.75m above deck;
- Helmsperson at helming position; and
- For multi-deck vessels, the vertical distribution of simulated passenger/crew weight should reflect actual operational distribution of complement.

A vessel is *fully decked* if:

- the deck is watertight, i.e. no more than 5 centilitres (a little less than ¼ cup) of water passes through any opening closure (e.g. hatch) when sprayed directly for three minutes with a hose delivering a flow of at least 10 litres/min;
- the deck is located above the waterline in fully loaded condition; the minimum height of deck above waterline may be determined by linear interpolation depending on vessel's length – 6 metres - 200 mm; 9 metres- 250 mm; and 12 metres - 300 mm. Effective non-return devices may be considered as an alternative allowing for reduction of this requirement, but in any case, the deck cannot be located lower than 75mm above loaded waterline; and
- the area of the freeing ports is at least 4% of bulwark area, or watertight cockpits/recesses have a combined volume not more than  $(\text{Vessel Length} \times \text{Vessel Breadth} \times \mathbf{F})/40$ , where **F** is the distance from top of the gunwale or deck to waterline at mid-length. At a minimum, two freeing ports (one port and one starboard) may be accepted each having a clear area of at least 225 cm<sup>2</sup> – the ports may be fitted in the transom on vessels where the shipping of water will not result in a trim by the head, preventing the deck from draining.

Note: **F** (freeboard) is used to determine whether a cockpit/recess can be ignored from the perspective of swamping by calculating its volume as a percentage of reserve buoyancy. If a vessel has a well deck with scuppers only, then **F** would be measured from the gunwale, if, however, there are large freeing ports (minimum 4% of bulwark area) or flush deck with rails only, **F** should be measured from the deck.

An *open* vessel is any vessel not qualifying for “*fully decked*” definition; *open* vessels should be fitted with effective means of preventing accumulation of rain/spray water in the vessel.



### Part 3

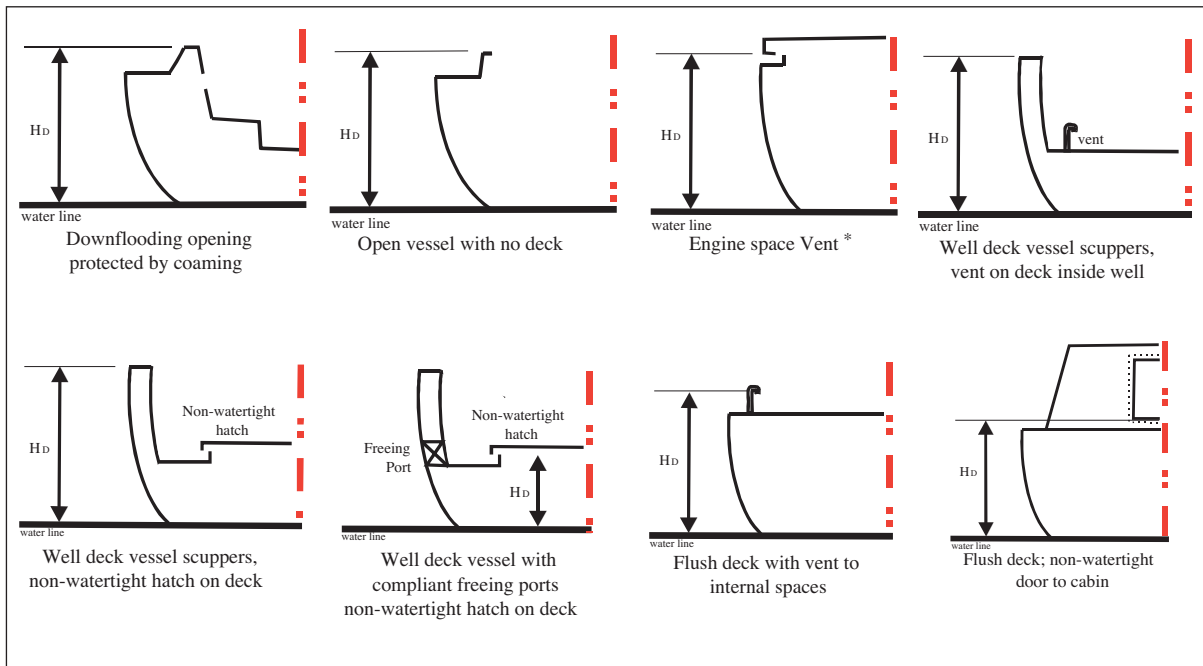
## DOWNFLOODING HEIGHT MEASUREMENT - EXAMPLES

Downflooding height - the lowest height measured from the waterline to an opening, e.g. vents, non-watertight hatches, gunwale, that will allow water to enter the interior of the boat or bilge of the vessel.

Examples of the measurement of this height on differently configured vessels are provided below.

# Downflooding Height (upright)

## $H_D$



\*If the engine space of an open decked vessel is provided with a high water alarm and fitted with an efficient bilge pumping system, louvered engine space vents are not considered downflooding openings.

## Part 4

**EVALUATION CRITERIA****MINIMUM DOWNFLOODING HEIGHT (m) IN UPRIGHT CONDITION**

Fully decked vessel		$L/17$
Open vessel	6m – 7.5m	$L/10$
	7.5m – 12m	$0.75m$

*L – Length overall in metres*

*Examples:* 7 metre fully decked vessel 41 cm ( $7\text{ m}/17 = 0.41\text{ m}$ )  
 7 metre open vessel 70 cm ( $7\text{ m}/10 = 0.70\text{ m}$ )

**MAXIMUM ALLOWED OFFSET LOAD HEEL ANGLE**

Vessel Length (m)	6	7	8	9	10	11	12
Maximum Offset Heel Angle (°)	15.2	13.8	12.5	11.0	10.0	9.1	8.3

**MINIMUM RESIDUAL DOWNFLOODING HEIGHT**

(Minimum downflooding height when heeled)

Vessel Length (m)	6	7	8	9	10	11	12
Minimum Residual Downflooding Height (m)	0.27	0.29	0.31	0.33	0.35	0.36	0.38

**Note: Interpolate for intermediate lengths and extrapolate for length over 12 m (not more than 15 Gross Tons)**

## Part 5

### **GUIDELINES FOR VESSELS THAT DO NOT MEET A STANDARD**

Where a vessel does not meet the requirements of the selected standard, the owner may elect to reassess the vessel against another acceptable standard in its entirety.

If the vessel's certification does not already indicate operating restrictions that reflect the results of the stability assessment, the owner should provide written instructions to guide the operator away from situations that could place the vessel in undue risk, e.g. maximum distance from shore and/or safe haven; limitations if poor weather is forecast; restrictions on wave height/wind speed.

As a general guideline, limiting the environmental conditions in which the vessel will operate, e.g. wave height, will reduce the probability of stability related incidents.

If the operating restrictions are too limiting for the vessel's operation and modifications to bring the vessel into compliance are not feasible, the owner can provide safety measures in addition to those required by the regulations, which provide **equivalent safety**. Equivalent safety could be interpreted as a reduction of the likelihood of an incident, e.g. radar, or enhanced lifesaving capability for passengers and crew in the event of incident, e.g. EPIRB, thermal protection, liferaft, such that there is no increase in the probability of injury.

Open vessels that do not meet the minimum downflooding height requirement should demonstrate a sufficient amount and suitable distribution of reserve buoyancy so as to prevent them from sinking/capsizing in swamped condition. Where insufficient, additional flotation material may be retrofitted.

The following are some examples of mitigating safety measures that may be given consideration in case of non-compliance of a vessel with criteria for intact stability, buoyancy and watertight integrity:

- reducing the number of persons permitted to be carried;
- adding flotation to increase reserve buoyancy providing swamping survivability;
- restricting the wave height and/or wind speed in which the vessel is permitted to operate; and/or
- restricting the area and time of operation of the vessel.